PROF. FRANKLIN P. MALL.

ALL who are interested in the progress of biology will learn with deep regret of the sudden death of Dr. Franklin P. Mall, of Johns Hopkins University, at the age of fifty-five. It was chiefly owing to his precepts and example that, in little more than a score of years, a complete revolution was wrought in the anatomical departments attached to medical schools throughout the length and breadth of the United States. Dissecting-rooms were changed from places in which routine teaching and perfunctory investigation were carried on to laboratories where exact methods were applied to the elucidation of definite problems. Prof. Mall was thirty-one years of age when he returned in 1893 from a long course of study under the late Prof. His, of Leipzig, to become the first professor of anatomy in Johns Hopkins University, Baltimore. He designed his own department, selecting a slimly built, cheap, brick construction, and settled down with his students to combine study with research. He devoted himself to embryological and microscopic investigations, reconstructing his results in the exact model methods practised by Prof. His. His writings cover the whole field of embryology, every contribution representing a permanent addition to knowledge. His pupils left him to fill the various chairs of anatomy as they fell vacant, and carried to their new departments the methods and spirit they had imbibed from Franklin Mall. He took a leading part in the foundation of the excellent journals which have been established in the United States for the publication of anatomical investigations—the *American Journal of Anatomy*, the *Anatomical Record*, and the *Journal of Morphology*. He pursued the study of human embryology in a more systematic manner than has ever been accomplished by any other man.

Prof. Mall began to collect embryos in the earlier months of development when he settled in Baltimore, and continued year by year to preserve, register, and photograph them; they were cut into serial sections, examined, reconstructed, and methodically stored, so that student after student could use the same sections for researches of quite different kinds. By 1913 his collection of embryos numbered more than 1000, many of them showing early stages of diseases and malformations. When he succeeded in persuading the Carnegie Institution of Washington to establish a National Department of Embryology, he handed over to it the whole of his embryological collection and accepted the post of director of the department. The names of the workers he enlisted in the service of the department, and the great scientific value of the "Contributions to Embryology," issued by the Carnegie Institution, are ample evidence of the success of his last piece of statesmanship.

Prof. Mall was a quiet, kind, and charming man, who had set himself a public-spirited but arduous task, and he lived long enough to see it well begun and to leave behind a band of pupils who are willing and able to carry it on.

NOTES.

PROF. A. G. NATHORST, of Stockholm, having on November 7 last reached sixty-seven years of age, has, in accordance with Swedish laws, retired from his appointment as keeper of the palæobotanical department of the Swedish State Museum of Natural History (Naturhistoriska Riksmuseum). His successor has not yet been appointed.

THE efforts of Sir Harcourt Butler in developing the mineral resources of Burma have been successful. There are prospects, says the *Pioneer Mail* of November 3, that the production of wolfram in Tavoy will soon be largely increased. One or two mines which until recently were cut off from communications are now being developed, and promise an outturn of 30 to 40 tons per month. Some rich new finds have been made in old blocks, and with the new road to the Pe Valley belt, extensions of present roads, and rumours of the promotion of new companies in England, the prospects of the industry have much improved.

THE council of the National Museum of Wales is devoting special attention to the insect collections. Six thousand specimens, of which a large proportion are Welsh examples, have been classified. Experiments as to the best methods of mounting and preserving small-winged insects and larvæ are being carried out. There are still, however, several groups almost unrepresented, and an appeal is made to collectors to add any specimens of interest, so that Welsh entomology may be adequately represented.

Two pamphlets on the Channel Tunnel have reached us—one by Mr. Arthur Fell, chairman of the House of Commons Committee on the question, the other by Sir Francis Fox. Mr. Fell strongly criticises the Government for refusing to allow any preliminary steps to be taken by the Channel Tunnel Company. He not only dwells on the economic and military value of the tunnel, but also emphasises the political aspect of the problem. Sir Francis Fox's pamphlet is a reprint from the *Geographical Journal*. It deals with the engineering aspects of the tunnel. The tunnel is designed to keep within the grey chalk, except near the two coasts, where for a short distance it passes through the gault. The depth below the sea-bed is to be a minimum of 100 ft. The tunnel will consist of two tubes, each 18 ft. in diameter, with cross-tunnels every 200 yards. It is proposed to form a "water lock," a dip in the tubes, which could, in case of emergency, be filled with water for the length of a mile. The water would not injure the tunnel works, and it could be pumped out only by the machinery at the power station in Kent. Trains could run between London and Paris *via* the Channel Tunnel in six hours.

WHEN a person feels that the air of a room is dry and oppressive the feeling is generally explained as due to the relative humidity or fraction of saturation of the air being low. The erroneous character of this explanation was pointed out two years ago by Dr. Leonard Hill and his colleagues of the Medical Research Committee in a communication to the Royal Society. They ascribe our sensation to the rate of loss of heat from the skin by evaporation, and have constructed a thermometer with a large bulb covered with moist fabric to measure this rate of loss under different conditions as to temperature, saturation, and speed of motion of the air, the bulb being kept at about the temperature of the human body. The agreement between the instrument and the "feel" of the air is found to be fairly close. The subject has been carried a stage further by the work of Mr. G. T. Palmer, chief of the research staff of the New York Commission on Ventilation. He finds that our sensation is due, not to the rate of evaporation from the surface of the body, but to the difference between that rate and the rate of supply of moisture from the interior of the body to the skin. His paper will be found in the July number of the Journal of the American Society of Heating and Ventilating Engineers.

In the December issue of *Man* Mr. A. C. Breton describes, with a photograph, a curious scene from a painted pot found in a mound in British Honduras, and now in the Liverpool Museum. It represents a group of strange winged creatures which appear to be dancing and singing for joy at the coming of vegetation, represented by a seedling in the corner. The humming-bird was the special messenger of the sun to awake and encourage vegetation, and appears prominently in this group. It would seem a natural result of watching the migrating birds in spring that man should endeavour to imitate them in his ceremonial dances. Similar dances have been noticed in Queen Charlotte Islands, and the gestures of the creatures on this pot may be compared with those on British Columbian totem poles.

Co-partnership in nests, and presumably in the duties of incubation, is known to exist, at any rate sporadically, among many birds. Mr. J. Wiglesworth, in *British Birds* for December, records several cases of this kind among sheldrakes breeding on Steepholm, an island in the Bristol Channel. In one nest which he examined he found the eggs of no fewer than five birds. The frequency of this occurrence on this small island may perhaps be due to the limited nesting accommodation. This record, by so competent an authority, will be welcomed by ornithologists.

Whalers know well the excellent qualities of whale-meat, but doubtless the general public would need some persuasion to adopt it as a substitute for beef. A writer, however, in *California Fish and Game* for October suggests that, in present circumstances, a trial should be made. He proposes to begin with the Californian grey-whale (Rhachianectes), the carcass of which yields about twelve tons of most succulent "beef." Some, both in a fresh state and canned, has already been placed on the market, and it is to be hoped that success will attend the venture, for in this case it may lead to sane methods of conservation. At present whaling is being carried on utterly regardless of the future, so that unless something is done speedily the whales will follow Steller's sea-cow and many another valuable species which has fallen a prey to commercial "enterprise."

Dr. Eagle Clarke, in the *Scottish Naturalist* for December, continues his most interesting analysis of wild life in a West Highland deer forest. All students of our native fauna will be grateful for this contribution, especially as very little has yet been done in regard to altitudinal distribution. Over the area surveyed the fox is very numerous, at from 900 ft. to 3500 ft., while the badger, which seems here almost extinct, ascends no higher than 1500 ft. A few pairs of otters are to be found on Lochs Ossian (1269 ft.) and Treig, and on the river Ghuilbin. Formerly it frequented Loch na Lap (1930 ft.), but has not been seen there for some years. Many will probably be surprised to learn that the house-sparrow has but recently penetrated to these fastnesses, having followed the iron road into the Highlands. It is now resident at Corrour Station, at the summit of the West Highland Railway (1350 ft.). Thence it has established further outposts, but it has not yet reached Loch Treig.

An able history of the bats of Central Africa is given in an article in the Bulletin of the American Museum of Natural History, vol. xxxvii., 1917. The authors, Messrs. J. A. Allen, H. Lang, and J. P. Chapin, therein describe the material obtained by the American Museum Congo Expedition. Naturally, a considerable number of new species are described, but the value of the communication rests not so much on this as on the light it throws upon the life-histories of these animals, and the many remarkable structural modifications and secondary sexual characters which the authors have here brought together. Some of these were already known, but the range of these peculiarities has been enlarged by many striking additions. One of the most important of these concerns the air-sacs of that singular creature, the hammer-head bat. But the authors offer no comments on the function of the large cheek-pouch of this animal, though they give an excellent figure indicating its great size.

It has long been known that true bats existed among the earliest Tertiary mammals, but remains are very rare, and nothing has been discovered of the ancestry of the group. An imperfect skull of a new genus, Zanycteris, has now been obtained from one of the oldest Tertiary formations (Wasatch) in Colorado, U.S.A., and according to a description of the specimen by Dr. W. D. Matthew (Bull. Amer. Mus. Nat. Hist., vol. xxxvii., pp. 569–71), it seems to represent a highly specialised member of the family Phyllostomatidæ, which is still peculiar to tropical America. The skull is only unusual in the length of its slender snout and the comparatively small size of its canine tooth. Numerous comparatively modern fossil remains of bats have also lately been received by the American Museum from the caverns of Porto Rico. Among them one skull is especially interesting as belonging to the genus Phyllonycteris, of which only one species is known living in Cuba (H. E. Anthony, Bull. Amer. Mus. Nat Hist., vol. xxxvii., pp. 565–68, pl. lvi.).

The fishes of the fresh waters of Panama are described with great care and detail by Messrs. S. E. Meek and S. F. Hildebrand in vol. x., No. 15, of the zoological series of publications of the Field Museum of Natural History, Chicago. Though small collections of the fish-fauna have from time to time been made by tourists and others, no serious survey of the waters of the canal zone had been made until that organised co-operatively by the Smithsonian Institution, the Field Museum of Natural History, and the U.S. Bureau of Fisheries. The present memoir contains the results of this ichthyological reconnaissance. The need for such a survey was urgent, since it was not begun until much work had been done on the canal and natural conditions had already been considerably disturbed, but it was fortunately completed before the species of the two slopes had been allowed to intermingle. Before the survey began the Rio Grande, on the Pacific slope of the canal zone, had been thoroughly cut to pieces, and hence to measure the probable effect of this disturbance it became necessary to extend investigations to other streams east and west of the Rio Grande. As a consequence, data were collected which seem to show that several species have disappeared owing to the unfavourable conditions created by the construction of the canal. Five genera and thirteen species new to science are described in these pages, which, further, are illustrated by numerous excellent plates.

THE Smithsonian Institution has issued an elaborate monograph on "The Comparative Histology of the Femur," by Dr. J. S. Foote, professor of pathology in Creighton Medical College, Omaha, Nebraska (Smithsonian Contributions to Knowledge, vol. xxxv., No. 3, 1916). Prof. Foote's investigations commenced in 1909, when he casually observed, in a section of a turkey's femur, "a type of bone structure quite unlike that usually described." He therefore began a systematic investigation of bone structure as revealed by sections across the femoral shaft. In his monograph he gives descriptions of the sectional appearance of 440 femora—amphibian, reptilian, avian, and mammalian. Prof. Foote is of opinion that we must recognise not one, but three types of architecture in the minute structure of bone. In the type with which most students are familiar the bone is arranged in concentric systems—Haversian systems—in the centre of each of which there is a vascular channel. The Haversian is the commonest system in higher mammals. The more usual system in birds is quite different. In them the bone is arranged in laminæ, with vascular channels between the laminæ. A more primitive system than either the Haversian or "laminar" is what Prof. Foote describes as the "lamellar"—best seen in the femora of amphibians. In this type the bone is arranged in a series of lamellæ surrounding the medullary cavity, but there are no vascular channels either within or between the lamellæ, as in the two more highly evolved types of bone.

A LIST of the Hemiptera-Heteroptera of New England has been published by Mr. H. M. Parshley as an "Occasional Paper" (No. 7) of the Boston Society of Natural History. The list is prefaced by some suggestive distributional notes, in which the author points out that most of the species common to Europe and North America appear to be "massed" on or near the eastern seaboard of the latter continent.

WHILE studying the collection of fishes of the Academy of Natural Sciences of Philadelphia, Mr. H. W. Fowler discovered many interesting specimens from New England waters. These he describes in the Proceedings of the Boston Society of Natural History (vol. xxxv., No. 4). Three of these species are new to science, and one of them represents a family and genus hitherto unknown in New England waters. Some excellent text-figures add much to the value of this contribution.

AN interesting paper on recognition among insects is published by Dr. N. E. McIndoo (Smithsonian Miscell. Coll., vol. lxviii., No. 2), in which he summarises our knowledge of scent-producing organs among insects of different orders, and the responses made by various creatures to such chemical stimuli. A considerable section of the paper is occupied by an account of Dr. McIndoo's own experiments on the characteristic odours emitted by different hive bees—queen, drones, and workers of various occupations. The economic importance of the study of the reactions of insects is pointed out with many apt illustrations in Dr. C. Gordon Hewitt's recent address on insect behaviour as a factor in applied entomology (*Journ. Econ. Entom.*, vol. x., 1917, No. 1). Messrs. E. A. McGregor and F. L. McDonough, in Bulletin 416 of the U.S. Department of Agriculture, on the red "spider" of cotton (*Tetranychus bimaculatus*), give much attention to the mite's means of dispersal and its responses to seasonal and environmental change.

IN part 4 of vol. vii. and part 1 of vol. viii. of the Bulletin of Entomological Research, Prof. R. Newstead continues his "Observations on Scale-insects," describing several new species, and giving welcome figures of the little-known male of the common *Lecanium hesperidum.* In the latter number the Rev. J. Waterston has a noteworthy paper on a new species of Paraphelinus, a genus of small Hymenoptera, the larvæ of which feed in the eggs of grasshoppers. Drs. A. Ingram and G. W. Scott Macfie give structural details of the pupæ of West African mosquitoes. Mr. Rupert W. Jack, of Southern Rhodesia, brings forward evidence which has convinced him of the occasional transmission of trypanosomiasis by blood-sucking flies other than the tsetses (Glossina), such as tabanids and Stomoxys. There appear, however, to be limits to the spread of disease by such means, as they "have not resulted in *establishing* trypanosomiasis in any area away from the fly-belts." The *Review of Applied Entomology*, with its invaluable summaries, is now in its seventh volume, and a highly useful subject-index of the agricultural entries in the first three volumes, compiled by Mr. S. A. Neave, has just been published by the Imperial Bureau of Entomology.

A PAPER of special interest, literally "breaking ground" in a direction hitherto little worked in these countries, is Dr. A. E. Cameron's "Insect Association of a Local Environmental Complex in the District of Holmes Chapel, Cheshire" (Trans. Roy. Soc. Edinb., vol. lii., part 1, No. 2). Several American naturalists have lately given attention to the intensive faunistic and associational study of small areas, and Dr. Cameron has done the same kind of work for this small corner of north-western England with great care and thoroughness. The relations between the insects found and the ecological types of vegetation in the two meadows specially examined are pointed out. A feature of agricultural interest was noted in the dominance of crane-fly larvæ as root-feeders in one meadow and of "wire-worms" in the other. The paper represents a vast amount of systematic and statistical work, and it is to be hoped that, as Dr. Cameron has now transferred his activities to Canada, other of our entomologists may be incited to try similar lines of inquiry.

SEVERAL improvements in maps designed to show economic distributions are suggested in a paper by Mr. George Philip in the *Geographical Journal* for December (vol. l., No. 6). Mr. Philip has attempted, with a considerable measure of success, to give effect to the recommendations of the British Association committee's report on maps for school use. He has avoided peppering the map with symbols or names for the distribution of natural products, commercial commodities, or industries, and has restricted their use to coalfields and a few important natural products. Names are further reduced by giving only the initials of ports. The groundwork colouring is a combination of density of population and the type of vegetation. In the most densely populated regions distinction is made, by two tints of red, between highly developed manufacturing enterprise and horticultural or plantation industries. The other productive regions are shown in shades of green, and undeveloped regions in brown. The map thus indicates the present state of economic development. Only the most important trade routes are shown by land and sea; on the sea by bands the width of which varies with the volume of trade. Mr. Philip proposes a school atlas on these lines, with the continents on a scale of one to forty millions, except Europe, which would have a scale of one to ten millions. A specimen map of Eurasia accompanies the paper. Finer colour printing would improve this striking map.

A pamphlet by the late Prof. Henrik Mohn, "Der Luftdruck zu Framheim und seine Tägliche Periode" (Christiania: Jacob Dybwad), deals with the pressure at Framheim, lat. 78° 38′ S., long. 163° 37′ W., the most southerly meteorological station on the earth, established by Amundsen as his winter station during his Antarctic expedition. The observations were taken daily from April 1, 1911, to January 29, 1912, at 8 a.m., 2 p.m., and 8 p.m. local mean time, from a Kew pattern station barometer hung on a wall of the kitchen of the hut. A Richard barograph was also installed close to the barometer, and a Wild-Fuess barometer was kept, but the readings were not used for the computations, as they were not so trustworthy as those of the Kew pattern barometer. The height above sea-level of the barometers was 11·1 metres. Hourly values for each hour of the whole period are given, together with means and deviations. The pressure appears to vary from between about 710 and 765 mm., and the monthly means show a maximum of 753·23 mm. for December and a minimum of 726·60 mm. for October. The figures are also given for harmonic analysis, and the pressures of the different seasons are compared.

Korea (Chosèn) has developed a thoroughly systematic series of meteorological stations, and recently the results of observations for the lustrum 1911–15 have been compiled at the Meteorological Observatory of the Government-General of the peninsula. The shores are washed by the Yellow Sea and the Sea of Japan, and the geographical surroundings render it comparable in many ways with those of Italy. Observations are published for nine stations, fairly well scattered over Korea, and extending from Syeng-chin in the north to Mokpo in the south. One-half of the stations commenced observing in 1904, so that results are available in these cases for fourteen years. Pressure results at the several stations agree remarkably well *inter se*, which shows great care in the organisation, and the corrected mean for all stations combined, for the lustrum, is about 30 in., which agrees admirably with the mean value for the year given by the Meteorological Office on its mean pressure chart, given in a recently published barometer manual. Practically all meteorological elements are dealt with for the lustrum and for each station. For the several stations the monthly means are given deduced from four-hourly observations, for which the values are also printed for the several elements, so that most valuable details are available. Five-day means are also given for the various data.

The double compounds of the metallic halides with ether hitherto known are those with glucinum and titanium chlorides and with aluminium, mercuric and stannous bromides. The Journal of the Chemical Society for September contains a description by Messrs. A. Forster, C. Cooper, and G. Varrow of the preparation of double compounds of ferric chloride with ether and with benzyl sulphide. The former compound, $C_4H_{10}O,FeCl_3$, obtained by the interaction of anhydrous ferric chloride and dry ether, is a dark red, highly deliquescent solid soluble in benzene, but decomposed by alcohol or water. When heated it evolves pure ethyl chloride. The substance in ethereal solution reacts with dry ammonia, giving brick-red, amorphous compounds of varying composition. Benzyl sulphide ferric chloride, $(C_7H_7)_2S,FeCl_3$, obtained by mixing ethereal solutions of its two components in molecular proportions and allowing to stand for some hours, forms minute lemon-yellow crystals soluble in chloroform and slightly so in alcohol, but insoluble in ether or acetone. The crystals rapidly become brown on exposure to moist air, this reaction distinguishing them from tribenzylsulphinium chloride ferrichloride. Benzyl sulphide ferric chloride is slowly decomposed into its two constituents by water; with alkalis the products are benzyl sulphide and ferric hydroxide. If a solution of equimolecular proportions of benzyl sulphide and cyanide in dry ether is added to an ethereal solution of ferric chloride, tribenzylsulphinium cyanide ferrichloride, $(C_7H_7)_3SCN,FeCl_3$, is formed. This substance is obtained as lemon-yellow crystals insoluble in ether, but soluble in alcohol and chloroform. When treated with excess of ammonia in alcoholic solution the substance gives tribenzylsulphinium cyanide, $(C_7H_7)_3SCN$, which forms large white prisms, m.p. 41°, readily soluble in organic solvents, but only slightly so in water. In contact with water the cyanide completely dissociates in a few hours.

The solving of formulæ involving more than two variables by means of curves, alignment charts, isometric charts, etc., is now well known, and a good deal has appeared recently on these methods. Special slide rules have also been employed to a large extent, and are designed to solve problems connected with special trades. The first instalment of an article on the design of special slide rules, by Mr. A. Lewis Jenkins, appears in the *Engineering Magazine* for November, and contains much that will be of interest to any who may be called upon to produce a special instrument of this type.

Owing to the failure of several reinforced concrete floors in the United States within ten or a dozen years of their construction, Prof. H. J. M. Creighton, of Swarthmore College, has examined a large number of reinforced concrete structures in which cracks were developing, and gives the results of his investigations in the Journal of the Franklin Institute for November. He finds that in every case the cracks run along the reinforcing rods, and are due to the deteriorating action of salt and brine on the concrete. Solutions of the chlorides react with the lime and the silicates in the concrete, and penetrating to the iron of the reinforcement convert it into oxide and hydrate, which occupy more space than the metal and force the concrete apart. It is therefore necessary to waterproof reinforced concrete structures which will be in contact with brine, to cease to use in the concrete beach gravel which has not been thoroughly washed with fresh water, and never to add salt to the concrete to prevent it freezing during building operations in cold weather.

An interesting article on gear planers appears in *Engineering* for December 14. The most remarkable advance which has been made in the formation of the teeth of gear wheels is in the substitution of methods of generation for those of form-cutting. The principle is simple, and the results are precise. A master gear, either a rack or a pinion, imparts the correct shapes to the teeth of any gears of the same pitch. The basis tooth is that of the rack, with flanks having a predetermined pressure angle. This may be embodied in a worm-like hob; or a rack tooth can be used to generate a master pinion; or the tooth may be employed directly as a cutter; or several teeth can be included in a length of rack, sufficient in number to make contact with all the teeth that can be in mesh with the largest wheel to be generated in the system. The relative movements of the cutter and the blank are identical with those that will occur in the actual rack and its generated gear. Wheels produced thus will engage correctly with the rack and with each other, and require no corrections or easing. The cutter is fed tangentially to the gear blank in the intervals of the reciprocations of the cutter across the face of the blank. This is the principle adopted in the Sunderland generating spur-gear planer, manufactured by Messrs. J. Parkinson, of Shipley, and the article cited contains a fully illustrated description of this machine.

OUR ASTRONOMICAL COLUMN.

Comets.—*Popular Astronomy* for November contains particulars of the appearance of Wolf's comet during the autumn. On October 15 it was readily visible in a 5-in. finder, with a small central non-stellar condensation of the 12th magnitude.

Prof. V. M. Slipher photographed its spectrum at Flagstaff on August 25 and 26. The spectrum was chiefly continuous, even the strongest cometary emissions being faint; traces were seen of the cyanogen band at 3883, and of the hydrocarbon band at 4737. The spectrum was too narrow and faint to show the solar lines, but it was evident that the comet was shining almost entirely by reflected sunlight. This is not surprising, considering its great distance from the sun.

Mr. Viljev has made the unexpected discovery that the object photographed in September, 1916, which was announced as Encke's comet near aphelion, was not really that comet; there are thus at least three occasions (January, 1908, September, 1916, September, 1917) when a faint object was detected, nearly in the right position for the comet, and with nearly the right motion, and yet proving to have no connection with it. It brings forcibly before us what a large number of unknown faint objects (comets or minor planets) exist in the solar system. Mr. Viljev has taken over the computations relating to this comet that were formerly in Prof. Backlund's hands.

The following ephemeris has been calculated from Mr. Viljev's approximate elements. Perihelion passage will be 1918 March 24·313 G.M.T. E is the eccentric anomaly.

G.M.T.	E.	R.A.			Decl. N.		log r	log Δ
1918	°	h.	m.	s.	°	′		
Jan. 1·416	−70	23	0	54	3	24	0·1976	0·2223
6·086	68	23	5	8	3	41	0·1804	0·2221
10·574	66	23	9	44	4	1	0·1627	0·2210
14·880	64	23	14	36	4	23	0·1446	0·2188
19·008	62	23	19	40	4	48	0·1261	0·2156
22·961	60	23	24	55	5	15	0·1070	0·2113
30·357	56	23	35	46	6	11	0·0676	0·2003

Union Observatory, Johannesburg. — Circular No. 39 of the Union Observatory includes a series of micrometric measures of Eros made between May 15 and May 28 of the present year, and a discussion of the advantages of ruling star photographs with lines of right ascension and declination, as compared with the rectangular rulings of the Carte du Ciel. Another excellent example of the photographic maps now being issued from this observatory is included with the circular, and it is shown that from these the places of stars can be obtained with an accuracy which will suffice for most purposes. A further list of nearly 200 proper motions found and measured with the blink-microscope is also given; about fifty of them exceed 20″ per century, and many of the displacements are towards the solar antapex. Many of the centennial proper motions deduced, and believed to be trustworthy, are under 10″, and one is only 3·2″.

New Zealand Astronomical Tables.—For general information, the Government Astronomer of New Zealand has issued a series of astronomical tables calculated for the meridian of the Hector Observatory (*New Zealand Gazette*, No. 141). They give the sun's apparent right ascension and declination, and the Greenwich mean time at apparent noon, as interpolated from the Nautical Almanac, together with the Greenwich date. With the aid of auxiliary tables previously published, the G.M.T. at apparent noon may readily be deduced for any other meridian in New Zealand, and also the approximate times of sunrise and sunset.

DEVELOPMENT AND USES OF THE STATIC ELECTRICAL MACHINE.

A VERY great advance was made in the earliest form of electricity generator by the late James Wimshurst in the year 1882. At that time several forms of the Holtz and Voss machines were in use, but their behaviour was most erratic, the slightest moisture in the atmosphere rendered them useless, and under most favourable conditions the output of electricity was small indeed.

Wimshurst succeeded in producing a machine that would "excite" with certainty under almost any atmospheric condition, and by combining a number of plates was able greatly to increase the output. Since then many manufacturers of electrical apparatus have attempted to improve upon it and to convert it into a practical and mechanically efficient generator of electricity. The Medical Supply Association has now placed upon the market what appears to be a thoroughly trustworthy and strong British-made machine that will give, at a moment's notice, a continuous and powerful static discharge.

The mechanical construction of the machine is simple and very sound. Special attention has been devoted to the plates, which are of vulcanite. By an ingenious method of construction each plate is formed of three sheets of different qualities; this entirely stops any tendency to warp, and enables the outer surface to be formed of a very good quality brittle vulcanite that in itself would not bear the high speed of rotation. The whole machine is built upon a cast-iron table, and is run by an attached motor or by any other convenient means; it is not covered in any way, as the perfection of construction is such that electricity is generated immediately on rotating the plates even in the dampest weather.

The uses of the machine are very numerous. It has been employed with success in agricultural experiments, where greatly increased plant growth under the influence of the static discharge has been recorded. In electro-therapy its value is fully recognised, and the static discharge is now in constant use in many hospitals. For the production of X-rays the machine has advantages over the induction coil, the current being unidirectional and continuous. For fluoroscopy or screen work this is a great gain, as the image is bright and absolutely free from flicker. Except where very short exposures are necessary, as in the case of instantaneous radiography, it will do the work as well as, or even better than, a coil. The twelve-plate machine is run at 900 revolutions per minute, and gives a good discharge between balls 8 to 10 in. apart; currents from ¾ to 1 milliampere can be passed through a suitable tube.

One great convenience of the machine is the complete absence of complicated resistance coils, meters, and other accessories; no electrical knowledge is demanded in its use; it is always ready, and it only needs rotating to produce the current. The cost of running with an electro-motor works out at ⅞*d*. per hour.

The machine can be seen at the rooms of the Medical Supply Association, 228 Gray's Inn Road, London, W.C.1.